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Karyotypes of Four Xystodesmid Millipeds from Japan

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田辺　力[1]：日本産ババヤスデ科４種の核型

Abstract The karyotypes of males of four xystodesmid millipeds from Japan, *Parafontaria circula* (ATTEMS), *Parafontaria* sp., *Levizonus montanus* (TAKAKUWA) and *Riukiaria semicircularis semicircularis* (TAKAKUWA), were examined by air dry method. *Parafontaria circula*, *Parafontaria* sp. and *Levizonus montanus* exhibited 2n=12 chromosomes. *Riukiaria semicircularis semicircularis* showed 2n=16. *Parafontaria circula*, *Parafontaria* sp. and *Levizonus montanus* were similar to one another in the relative lengths of chromosomes.

Up to the present, the karyotypes of millipeds have been studied for 60 species (ACHAR, 1987). The chromosome number of these millipeds ranges from 2n=12 to 2n=30. The sex-chromosome mechanism is XY-type in most those species studied. In the order Polydesmida, three species of the family Paradoxosomatidae and two species of the family Polydesmidae has been examined. However, no karyotype has been reported for the family Xystodesmidae.

The author examined the karyotypes of four Japanese xystodesmid millipeds, *Parafontaria circula* (ATTEMS), *Parafontaria* sp., *Levizonus montanus* (TAKAKUWA) and *Riukiaria semicircularis semicircularis* (TAKAKUWA), by air dry method.

Materials and Methods

Adult mlaes were used. Observations were conducted by air dry method from May to June, 1988, when millipeds showed high reproductive activity to provide for succeeding oviposition during the summer, and in September, 1988, when new adults emerged (Table 1).

Procedures of chromosome observations are as follows: 1) Submerge living adult males in a bottle full of Ringer's solution for *Drosophila* in order to get millipeds weak, because it is difficult to dissect active millipeds. 2) Dissect out

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Table 1. Chromosome numbers of males of four xystodesmid millipeds from Japan.

Species and locality	Date of dissection	No. indiv. obs.	2n chromo. no.	No. modal cells[1)]
Parafontaria circula				
Mizuho-cho, Kyoto	9–VI, 13–IX–1988	1	12	15
Ruri-kei, Kyoto	29–V, 2–VI–1988	2	12	13
Parafontaria sp.				
Ruri-kei, Kyoto	6–VI–1988	1	12	23
Levizonus montanus				
Lake Shûparo-ko, Yubari	13–IX, 2–X–1988	2	12	8
Riukiaria semicircularis semicircularis				
Seki-cho, Mie	23–V–1988	1	16	9
Shigaraki-cho, Shiga	28–V–1988	1	16	2
Yakuno-cho, Kyoto	29–V–1988	2	16	55

1) Number of cells with modal chromosome number in spermatogonial metaphase.

testes in the Ringer's solution on a pétri dish. 3) Transfer the organs to colchicine hypotonic solution (0.05–0.1% colchicine, 1% sodium citrate) in a 20 ml bottle and leave for 15–40 minutes. 4) Transfer the organs to freshly-prepared fixative (absolute methanol: glacial acetic acid = 1:3 or 1:4 or 1:5) and leave for more than 5 minutes. 5) Transfer the fixed material together with fixative onto a slide. 6) Place the slide under a dissecting microscope and add one drop of acetic acid–lactic acid (glacial acetic acid: absolute lactic acid: distilled water = 6:1:1). This treatment dissociates the tissue into single cells and clumps of cells. 7) When the material becomes transparent, tear membrane of it using a minute insect pin in order to flow cells out of the tissues. 8) Transfer the slide onto a hotplate set 40–45°C. This treatment increases well spread metaphase plates. 9) Immediately add 5–10 dorps of freshly-prepared fixative at appropriate intervales. 10) After the slide completely dries, leave it for more than one day at room temperature. 11) Stain the slide by Giemsa solution.

Specimens examined (all specimens were collected by T. TANABE): *Parafontaria circula*: Ijiri, along the National Highway 9, Mizuho-cho, Kyoto-fu, Honshu, May 13, 1988, 1♂. Ruri-kei, Sonobe-cho, Funai-gun, Kyoto-fu, Honshu, August 13, 1986, 1♂. Locality as above, May 13, 1988, 1♂.

Parafontaria sp.: Ruri-kei, Sonobe-cho, Funai-gun, Kyoto-fu, Honshu, May 13, 1988, 1♂.

Levizonus montanus: Lakeside of Lake Shûparo-ko, 340 m alt., Yubari-shi, Hokkaido, September 11, 1988, 2♂.

Riukiaria semicircularis semicircularis: Urajiro-tôge Pass, Shigaraki-cho, Koga-gun, Shiga Pref., May 13, 1988, 1♂. Along the National Highway 25, Kabuto, Seki-cho, Suzuka-gun, Mie Pref., Honshu, May 14, 1988, 1♂. Chihara, Yakuno-cho, Amata-gun, Kyoto-fu, Honshu, May 12, 1988, 2♂.

Results and Discussion

Parafontaria circula, *Parafontaria* sp. and *Levizonus montanus*, each exhibited 2n = 12 chromosomes whose number is the lowest one in millipeds (Table 1, Fig. 1 A–C). On the other hand, *Riukiaria semicircularis semicircularis* showed 2n = 16 chromosomes (Table 1, Fig. 1 D).

Parafontaria circula, *Parafontaria* sp. and *Levizonus montanus* were similar to one another in the relative lengths of chromosomes in their karyotypes. The most remarkable feature in common was the presence of a pair of submetacentric chromosomes much longer than the others, about 1.4 times larger as long as that

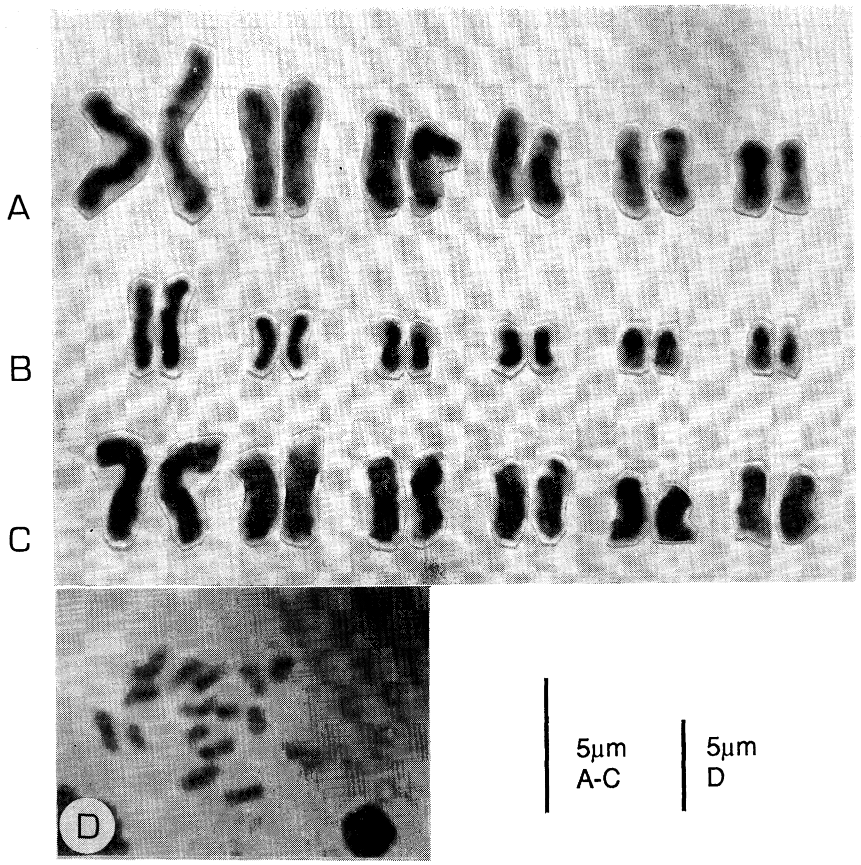

Fig. 1. Male karyotypes of four species of xystodesmid millipeds from Japan.——A, *Parafontaria circula* from Mizuho-cho, Kyoto. B, *Parafontaria* sp. from Ruri-kei, Kyoto. C, *Levizonus montanus* from Lake Shûparo-ko, Yubari. D, *Riukiaria semicircularis semicircularis* from Seki-cho, Mie.

of the 2nd. This similarity in karyotypes may suggest close relationship between *Parafontaria* and *Levizonus*, although each of the genera belongs to different subfamily.

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摘　要

日本産ババヤスデ科の4種 *Parafontaria circula* (ATTEMS), *Parafontaria* sp., *Levizonus montanus* (TAKAKUWA) *Riukiaria semicircularis semicircularis* (TAKAKUWA) の雄の核型をエアドライ法を用いて調べた. *Parafontaria circula*, *Parafontaria* sp., *Levizonus montanus* は 2n=12, *Riukiaria semicircularis semicircularis* は 2n=16 である. *Parafontaria circula*, *Parafontaria* sp., *Levizonus montanus* は染色体の相対的な長さにおいて類似する.

Reference

ACHAR, K. P., 1987. Chromosomal evolution in Diplopoda (Myriapoda: Arthropoda). *Caryologia*, **40**: 145–155.